

Adaptation to Wildfires in the West: Linking Science to Action

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Desert Research Institute, Reno, Nevada

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United States
Department of
Agriculture

Forest Service

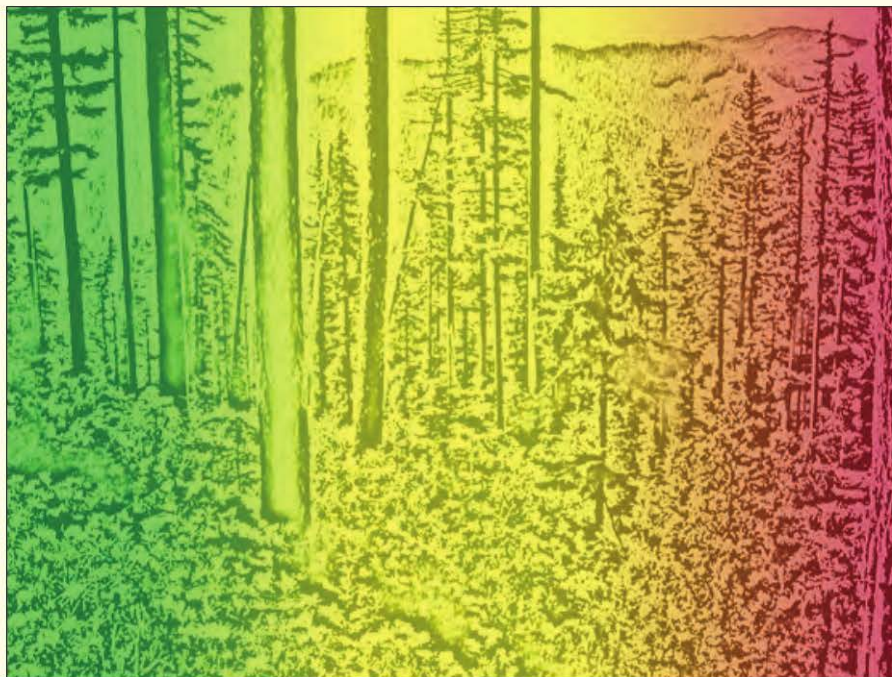
Pacific Northwest
Research Station

General Technical
Report
PNW-GTR-870

December 2012

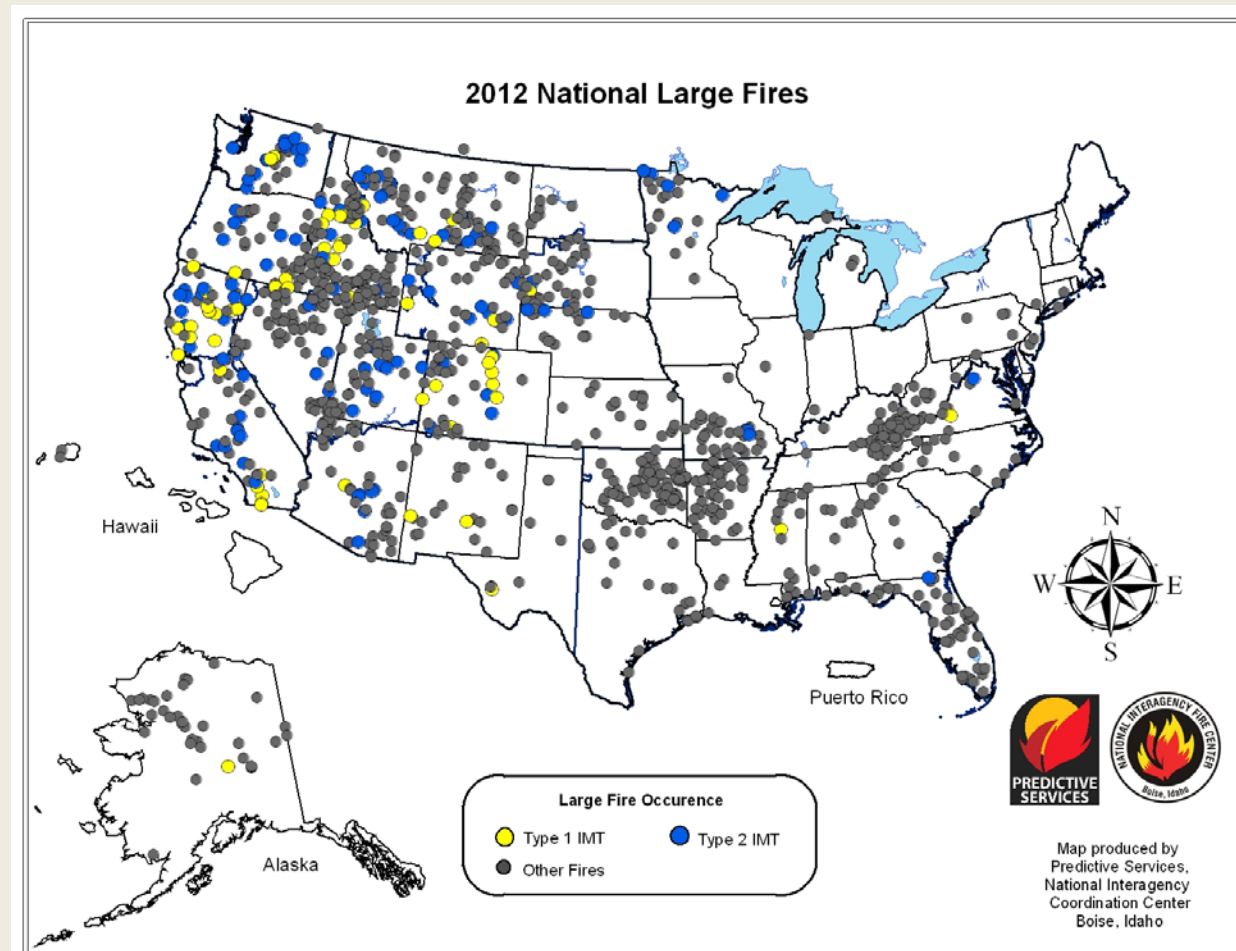


Effects of Climatic Variability and Change on Forest Ecosystems: A Comprehensive Science Synthesis for the U.S. Forest Sector



Disturbance Regimes

- Wildfire will increase throughout the U.S.



Disturbance Regimes

- Expanding insect infestations

Current advance of bark beetles in forests throughout the Western United States and Canada often affecting more land area per year than wildfire



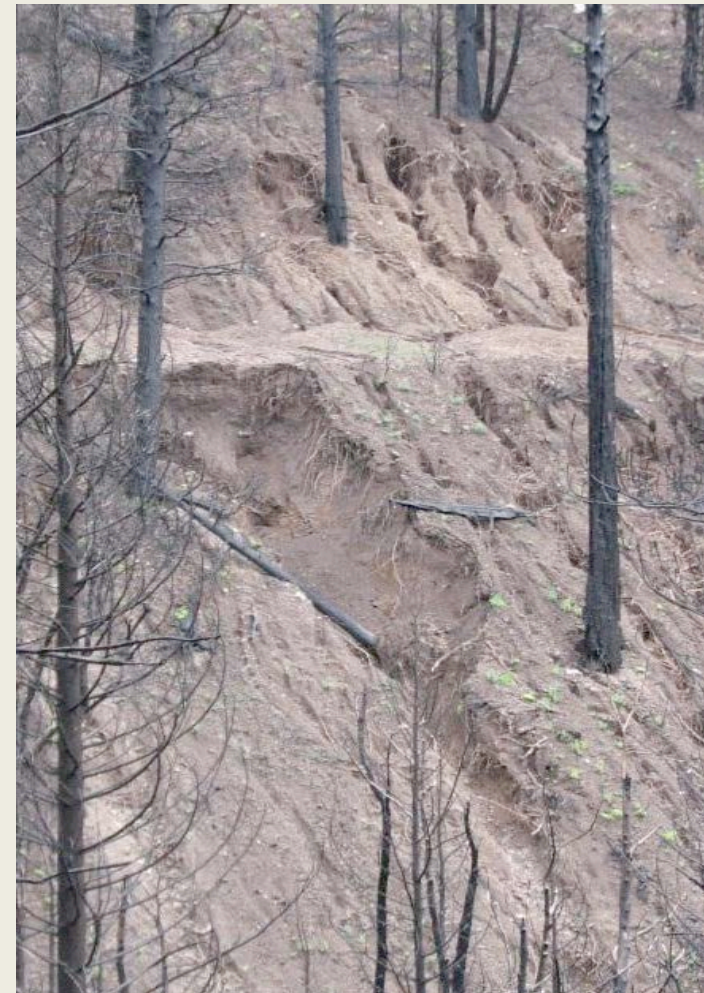
Disturbance Regimes

- Invasive species will likely become more widespread



Disturbance Regimes

- Increased flooding, erosion, and movement of sediment into streams will be caused by:
 - Higher precipitation intensity in some regions
 - Higher rain:snow ratios in western mountainous regions
 - Higher area burned (western dry forests)



Disturbance Regimes

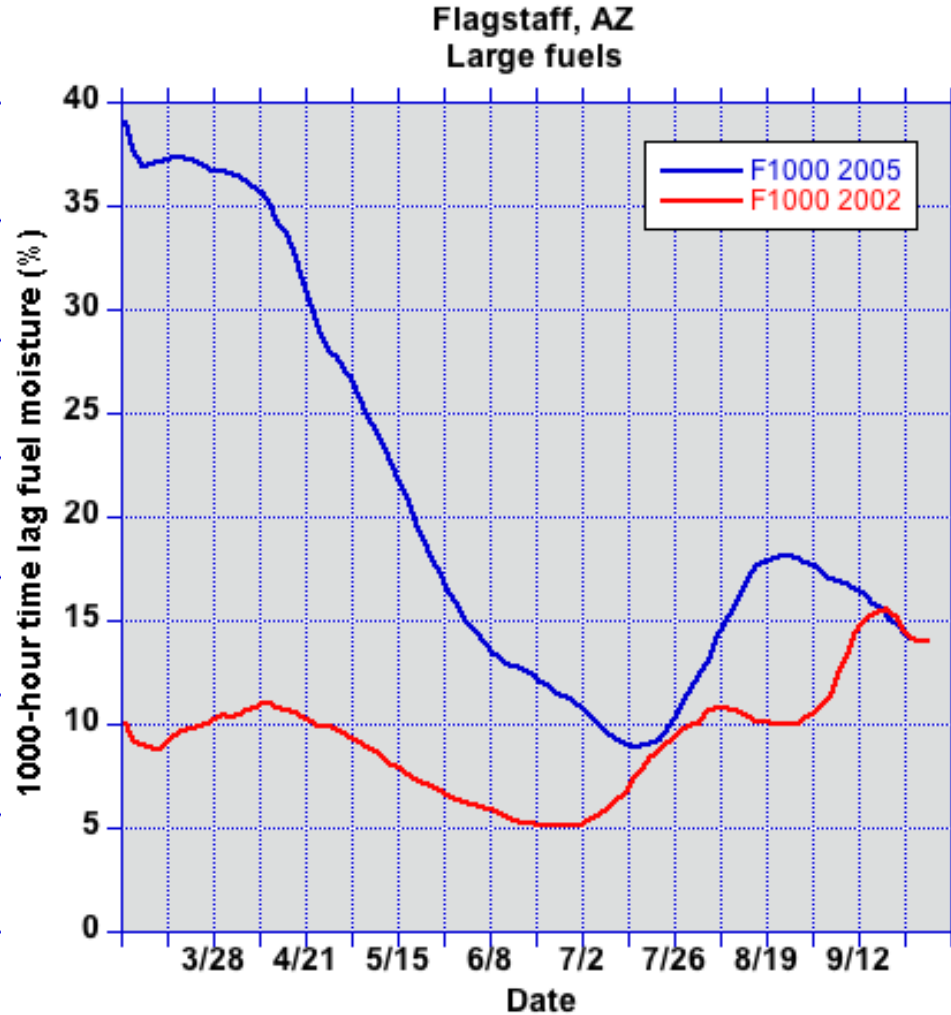
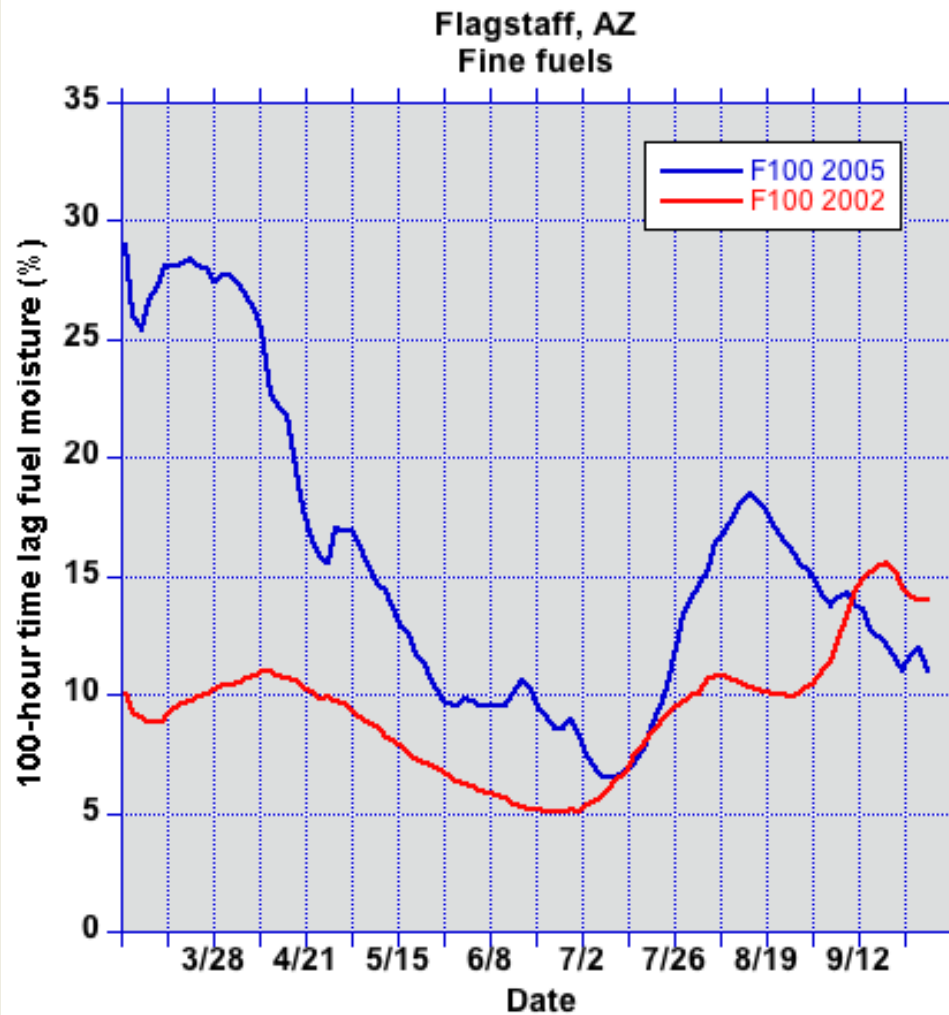
Increased drought will exacerbate stress complexes that include insects, fire, and invasive species, leading to:

- Higher tree mortality
- Slow regeneration in some species
- Altered species assemblages

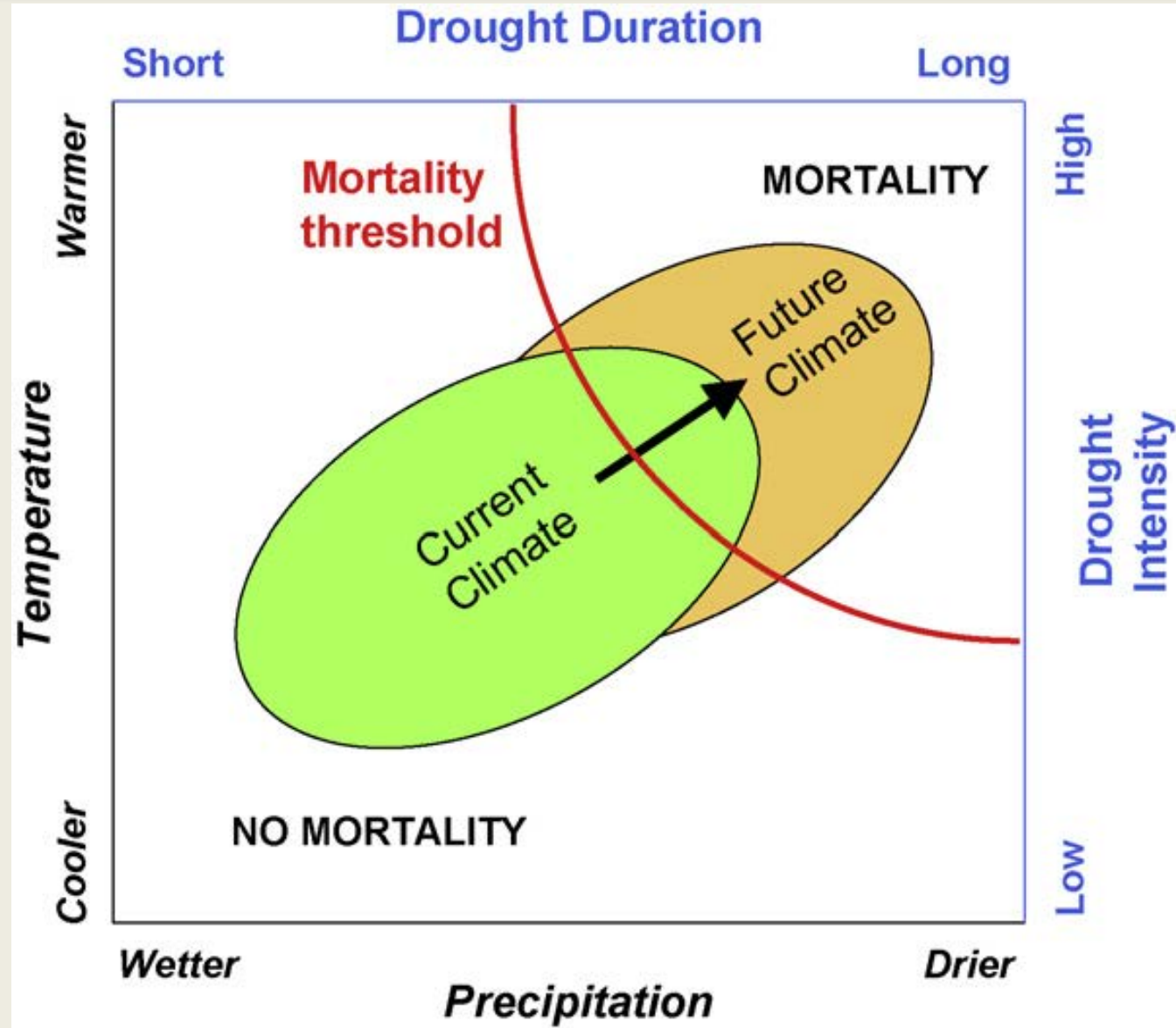


Photo: Associated Press

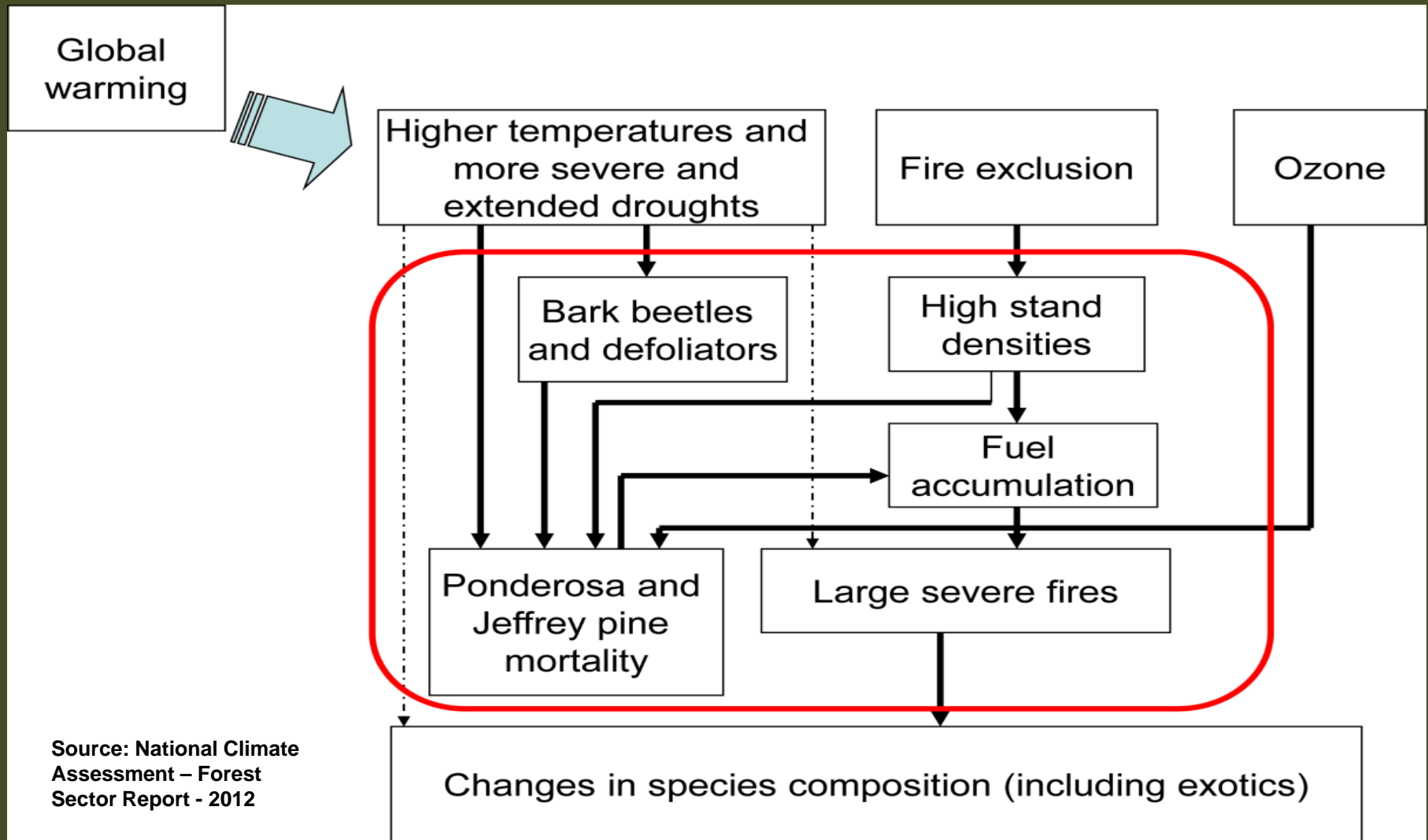
Relation of drought to fuel moisture



Conceptual diagram of drought and tree mortality



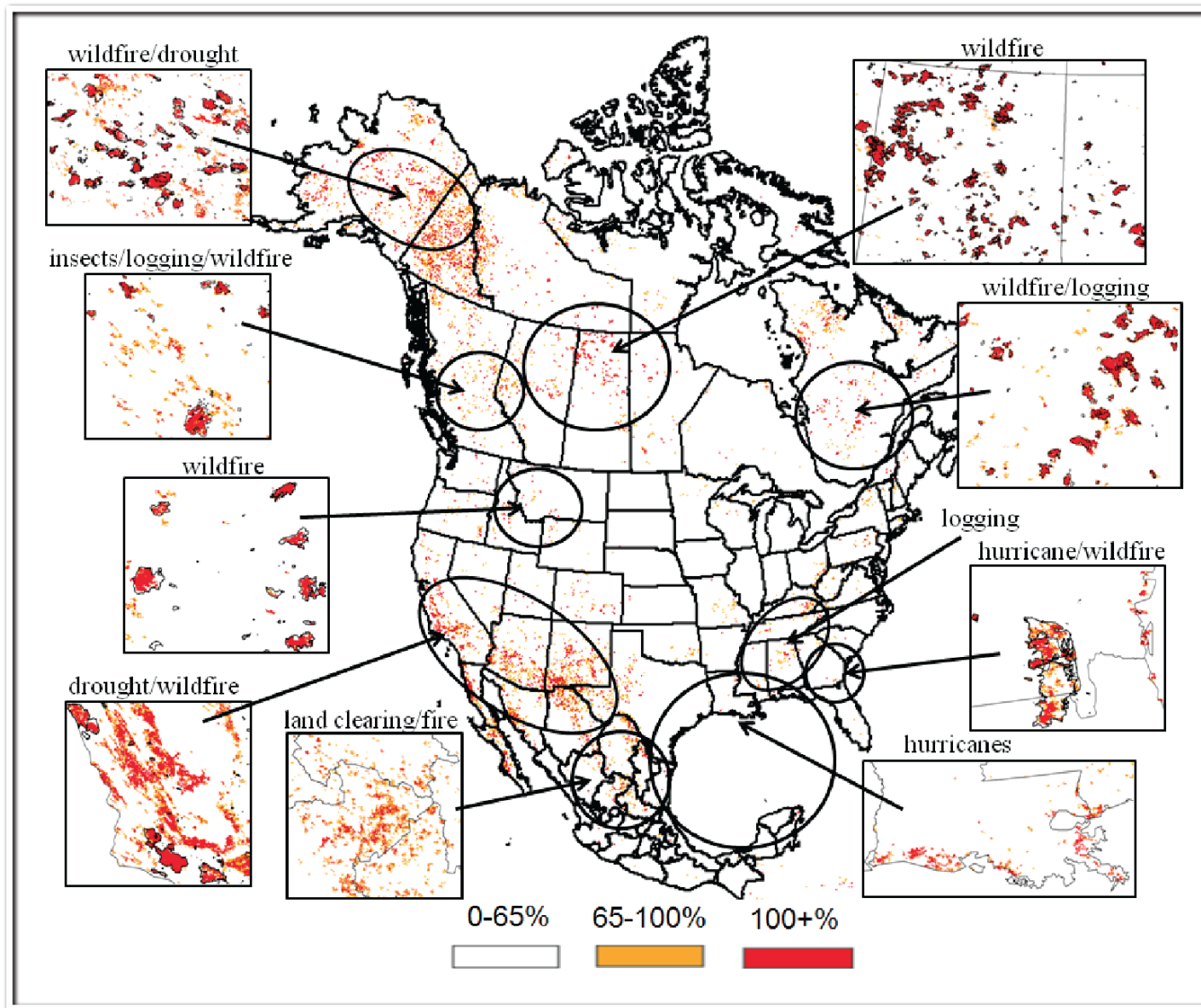
Stressor Complexes and System Changes



Changing Forests...Enduring values

Courtesy: Dave Cleaves, USFS

Forest Ecosystem Disturbances



Adaptation options suitable for conditions of forested ecosystems

- Promote resistance
- Increase resilience
- Enable ecosystems to respond
- Realign highly altered ecosystems

U.S. Forest Service initiatives for responding to climate change

- Furnish predictive information on climate change and variability
 - Develop, interpret, and deliver spatially explicit scientific information on recent shifts in temperature and moisture regimes, including incidence and frequency of extreme events
 - Provide readily interpretable predictions at regional and sub-regional scales

U.S. Forest Service initiatives for responding to climate change

- Develop vulnerability assessments
 - Assess the vulnerability of species, ecosystems, communities and infrastructure
 - Identify potential adaptation strategies
 - Assess the impacts of climate change and associate policies on tribes, rural communities and other resource dependent communities
 - Assess the vulnerability of threatened and endangered species and to develop potential adaptation measures

U.S. Forest Service initiatives for responding to climate change

- Tailor monitoring to facilitate adaptive responses
 - Expand observation networks, intensify sampling in some cases; integrate monitoring systems across jurisdictions
 - Monitor the status and trends of key ecosystem characteristics, focusing on threats and stressors that may affect the diversity of plant and animal communities and ecological sustainability
- Align Forest Service policy and direction with the Forest Service strategic response to climate change

Department of Interior Climate Change Adaptation Plan for FY13

- Guiding principles - science
 - Ensure that management decisions made in response to climate change impacts are informed by science
 - Build or access regional and local capacity to interpret climate science to inform adaptation plans for infrastructure and natural and cultural resources
 - Where appropriate, coordinate with other regional science resources in order to inform adaptation plans and actions

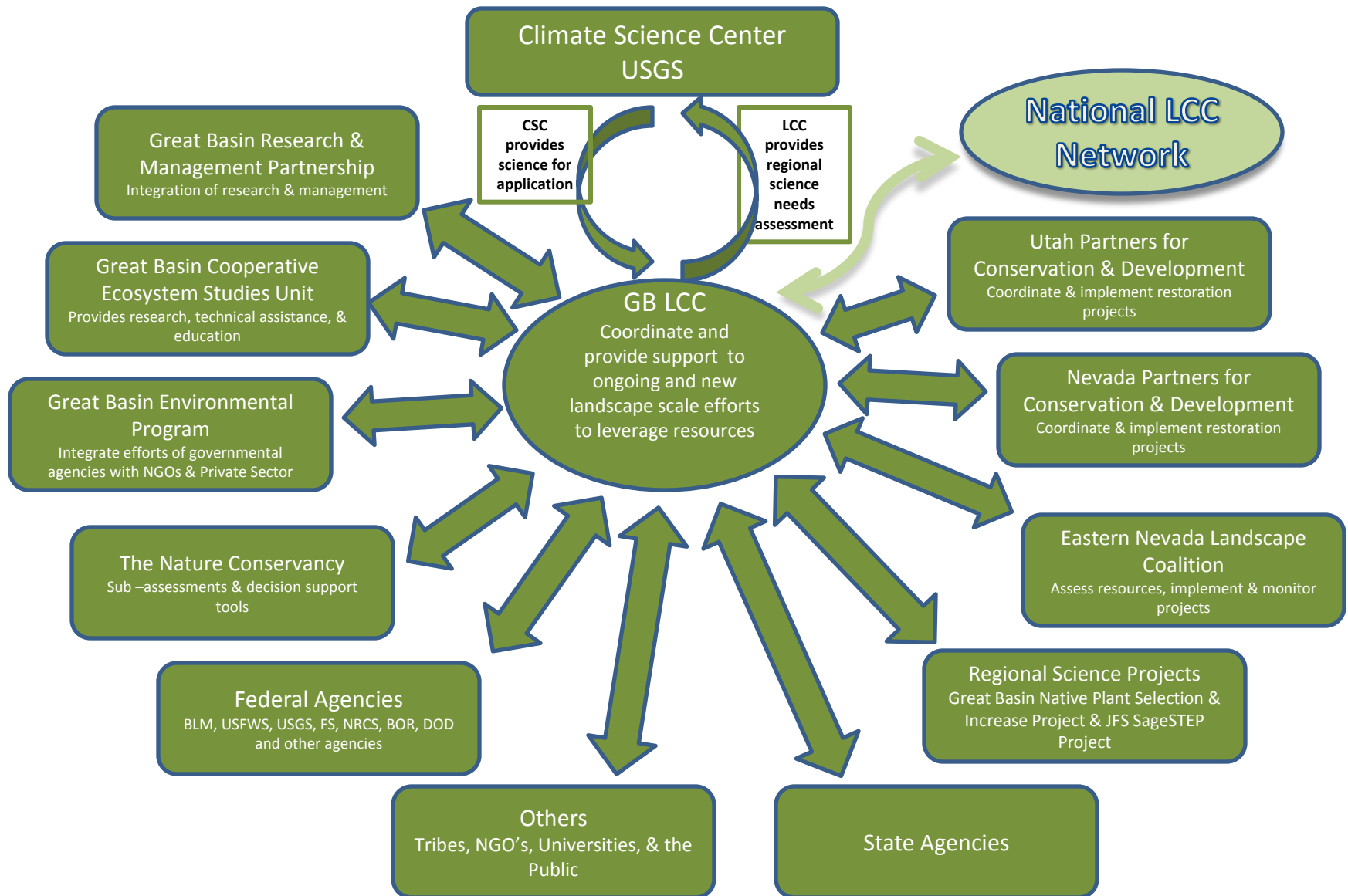
Department of Interior Climate Change Adaptation Plan for FY13

- Guiding principles - science
 - Where appropriate, ensure representation at the executive level on the Stakeholder Advisory Committee for each DOI CSC and the Steering Committee for each LCC
 - Facilitate and support data integration and access to enable broad use of scientific information for management decisions
 - Consider and incorporate Traditional Ecological Knowledge and long-term observational information as data sources

Table 4.3—Climate adaptation guides relevant to the forest sector

Category	Emphasis	Reference
Adaptation framework	General options for wildlands	Millar et al. 2007
	Options for protected lands	Baron et al. 2008, 2009
	Adaptation guidebooks	Peterson et al. 2012, Snover et al. 2007, Swanston and Janowiak 2012
Vulnerability analysis	Climate change scenarios	Cayan et al. 2008
	Scenario exercises	Weeks et al. 2011
	Forest ecosystems	Aubry et al. 2011, Littell et al. 2010
	Watershed analysis	Furniss et al. 2010
Genetic management	Seed transfer guidelines	McKenney et al. 2009
	Risk assessment	Potter and Crane 2010
Assisted migration	Framework for translocation	McLachlan et al. 2007, Riccardi and Simberloff 2008
Decisionmaking	Silvicultural practices	Janowiak et al. 2011b
	Climate adaptation workbook	Janowiak et al. 2011a
Priority setting	Climate project screening tool	Morelli et al. 2011b

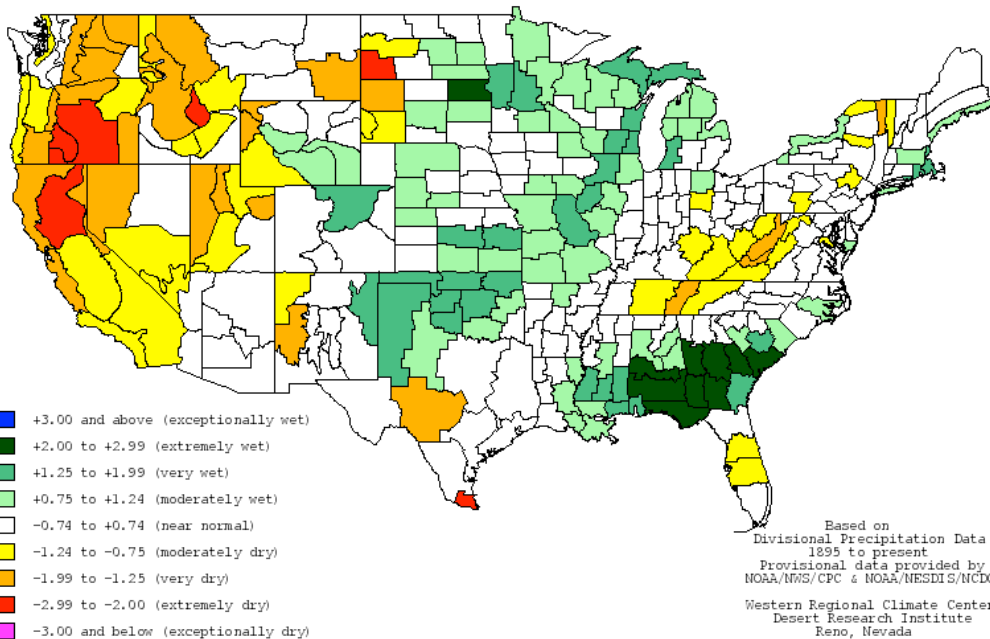
Great Basin Landscape Conservation Cooperative Organizational Concept



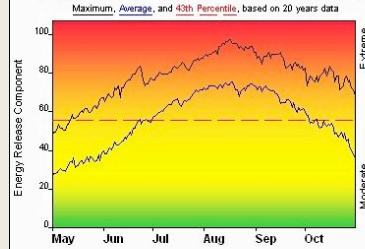
How science gets into things

Tim's world

1-month Standardized Precipitation Index through the end of February 2013



FIRE DANGER -- 2009 - Almanor RD - Lassen NF



Fire Danger Area:

- Almanor Ranger Dist.
- Northern Sierras PSA
- Chester RINWS
- * Meets NWCG Wx Station Standards

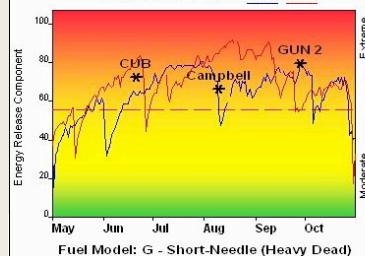
Fire Danger Interpretation:

- EXTREME** -- Use extreme caution
- Caution** -- Watch for change
- Moderate** -- Lower Potential, but always be aware

Maximum -- Highest Energy Release Component by day for 1989 - 2008
Average -- shows peak fire season over 20 years (2013 observations)
43th Percentile -- Only 43% of the 3613 days from 1989 - 2008 had an Energy Release Component below 55

Local Thresholds - Watch out: Combinations of any of these factors can greatly increase fire behavior:
20" Wind Speed over 10 mph, RH less than 20%,
Temperature over 80, Woody Fuel Moisture less than 90

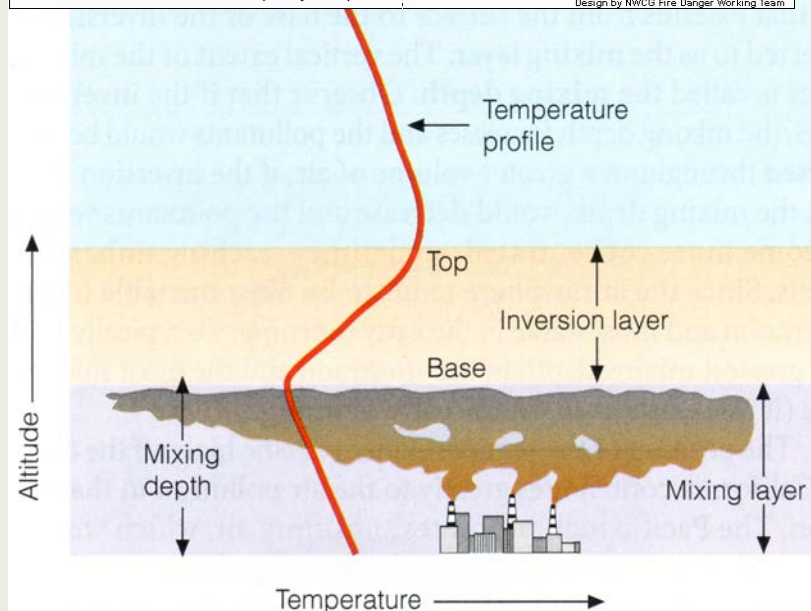
Years to Remember: 1999 2001



Remember what Fire Danger tells you:

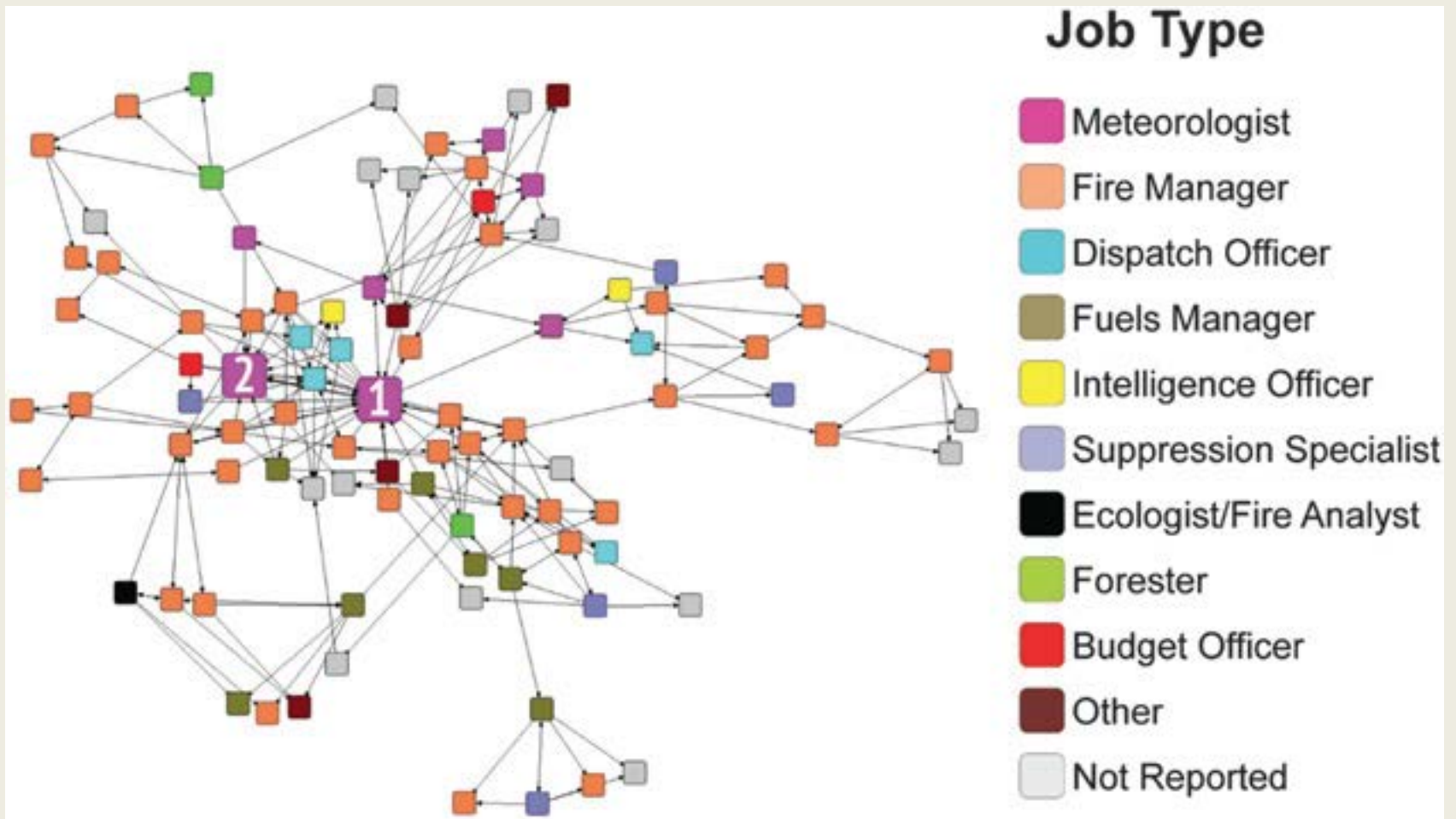
- ✓ Energy Release Component gives seasonal trends calculated from 2 pm temperature, humidity, daily temperature & rh ranges, and precip duration.
 - ✓ Wind is NOT part of ERC calculation.
 - ✓ Watch local conditions and variations across the landscape -- Fuel, Weather, Topography.
 - ✓ Listen to weather forecasts -- especially WIND.
- Past Experience:**
- 10 hr. fuels - fuel moisture of 5% or less expect easy ignition, rapid fire spread, and higher spotting potential.
 - North Winds (Foehn wind-like event) have a history of extreme fire behavior and large fire growth on the southwest-side (Front Country) of the forest. (especially Aug/Sep)
 - ERC's above 55 are associated with historic large fires.
- | Fire | Acres | Significant Factors: |
|------------------|------------|---|
| Campbell Complex | 125,592 ac | Power Lines, North Winds & light flashy fuels |
| Gun II | 60,260 ac | Heavy Equipment, North Winds & light flashy fuels |
| Cub Complex | 19,718 ac | Lightning, steep topography & fuels |

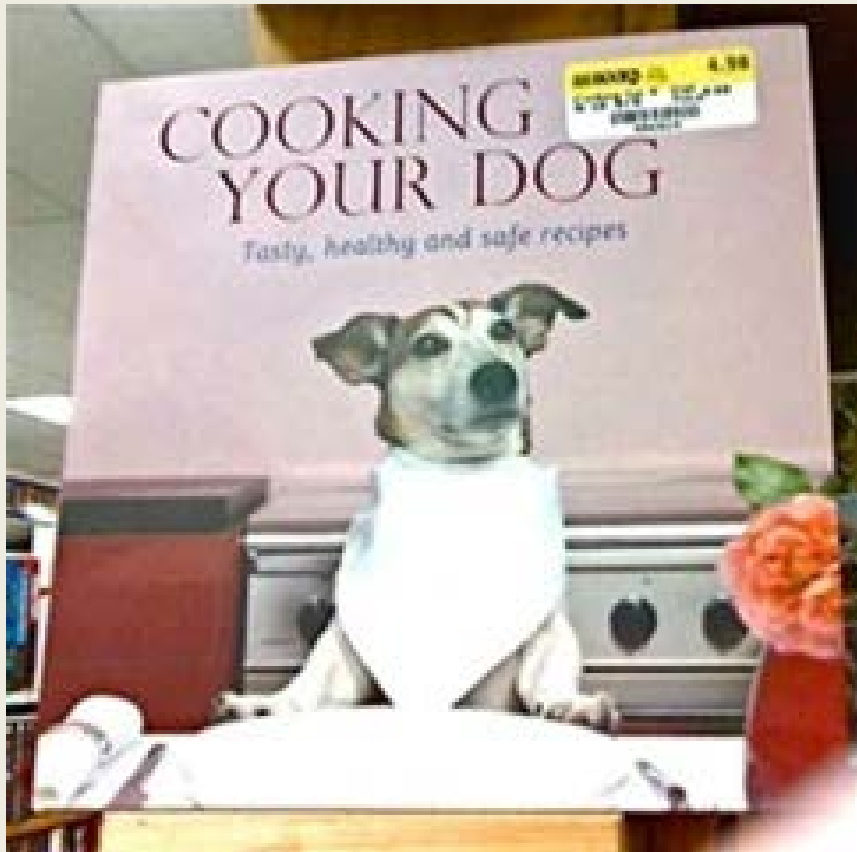
Responsible Agency: Lassen NF, Almanor RD, P. Doyle
FF-4 0.2 05/26/2009-16:38 (C:\Documents and Settings\pdoyle\My Documents\LNFF)
Design by NWCG Fire Danger Working Team



How science gets into things

The knowing





The need for
complete
information

